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Citation for published version:
Kanabar, R & Gregg, P 2021 'Intergenerational wealth transmission in Great Britain' UCL Centre for Education Policy and Equalising Opportunities (CEPEO).

Publication date:
2021

Link to publication

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CENTRE FOR EDUCATION POLICY
& EQUALISING OPPORTUNITIES

Working Paper No. 21-06

Intergenerational wealth transmission in Great Britain

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The aim of this paper is to document the intergenerational persistence of wealth between adult offspring and their parent's using the Wealth and Assets Survey for Great Britain. As parental wealth it is not directly observed it is assessed as mean values based on age, home ownership and education from retrospective questions. Estimates are then derived employing a commonly used two stage estimator. For offspring aged around 44 and parents aged around 74, the oldest where wealth can reliably be observed in the sample, the intergenerational wealth elasticity (IWE) is 0.4 and the rank-rank elasticity 0.3. However, wealth is a stock accumulated over a person's working life and then dissaving takes place in retirement. Thus, peak wealth holding occurs around the age of 64 and this represents a proxy measure of life-time wealth accumulation. Under certain assumptions about parental wealth holding we explore wealth persistence for older offspring up to age 64. Importantly, we find at these older ages wealth persistence is generally lower than for those currently aged in their 30s and early 40s, though rank based estimates are broadly stable. The average IWE is 0.35 (ages 28-64) and rank equivalent 0.3 in 2012. For those in their 30s however, the IWE is 0.4, even though the short panel suggests a strong life cycle bias where wealth persistence is lower at ages below 64. Exploration of this contradiction shows that those who have a relatively high wealth among older cohorts came from more typical backgrounds than in younger ones. The six year panel data also shows that intergenerational wealth elasticity is 3.8 percentage points higher when comparing people with those the same age six years previously. There is, thus, very strong evidence of higher wealth intergenerational persistence in younger age cohorts. As it was already higher than for older cohorts and has risen rapidly, standing at 0.44 (ages 32-44) by 2018.

VERSION: April 2021

Suggested citation: Gregg, P., & Kanabar, R. (2021). *Intergenerational wealth transmission in Great Britain* (CEPEO Working Paper No. 21-06). Centre for Education Policy and Equalising Opportunities, UCL. https://EconPapers.repec.org/RePEc:ucl:cepeow:21-06.

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Highlights

- We show there is a strong intergenerational relationship between parent and offspring wealth: with in the region of 35% of wealth differences in the parent generation pass onto their offspring.
- We document the importance of housing and pension wealth across different cohorts in Great Britain. Importantly, from an intergenerational perspective we find there is an important distinction between not having and having such sources of wealth and conditional on having, the level.
- The patterns of intergenerational wealth persistence is changing rapidly: wealth inequalities by family origin are widening in Great Britain in excess of 1 per cent every two years. The magnitude of this change is simply staggering and has profound implications for living standards inequalities in the future.
- Younger cohorts born 1968 onwards have higher levels of cross-generational persistence in wealth than those aged in their 60s. Moreover, evidence suggests there is far higher wealth persistence than for people who were at the same age just 6 years previously. We predict a IWE of 0.44 for those in their 30s in 2018 compared to 0.3 for those in their 60s in 2012. An extremely dramatic shift.
- We show that this is heavily driven through the way it is less common to observe individuals from typical family backgrounds to feature higher up the wealth distribution in the younger cohorts. By contrast the situation at the bottom of the wealth distribution is not changing very rapidly.

Why does this matter?

Our results show that younger cohorts are likely to exhibit far higher levels of wealth inequality at retirement, compared to those observed today. The rate at which wealth transmission is rising is staggering – more than 1.2 percentage points every two years later a person is born, this has profound implications for current and future living standards.

Intergenerational wealth transmission in Great Britain

Paul Gregg and Ricky Kanabar

April 2021

Abstract

The aim of this paper is to document the intergenerational persistence of wealth between adult offspring and their parent's using the Wealth and Assets Survey for Great Britain. As parental wealth it is not directly observed it is assessed as mean values based on age, home ownership and education from retrospective questions. Estimates are then derived employing a commonly used two stage estimator. For offspring aged around 44 and parents aged around 74, the oldest where wealth can reliably be observed in the sample, the intergenerational wealth elasticity (IWE) is 0.4 and the rank-rank elasticity 0.3. However, wealth is a stock accumulated over a person's working life and then dissaving takes place in retirement. Thus, peak wealth holding occurs around the age of 64 and this represents a proxy measure of life-time wealth accumulation. Under certain assumptions about parental wealth holding we explore wealth persistence for older offspring up to age 64. Importantly, we find at these older ages wealth persistence is generally lower than for those currently aged in their 30s and early 40s, though rank based estimates are broadly stable. The average IWE is 0.35 (ages 28-64) and rank equivalent 0.3 in 2012. For those in their 30s however, the IWE is 0.4, even though the short panel suggests a strong life cycle bias where wealth persistence is lower at ages below 64. Exploration of this contradiction shows that those who have a relatively high wealth among older cohorts came from more typical backgrounds than in younger ones. The six year panel data also shows that intergenerational wealth elasticity is 3.8 percentage points higher when comparing people with those the same age six years previously. There is, thus, very strong evidence of higher wealth intergenerational persistence in younger age cohorts. As it was already higher than for older cohorts and has risen rapidly, standing at 0.44 (ages 32-44) by 2018.

JEL classification: D31, D63, I24

Keywords: Wealth, Inequality, intergenerational mobility, Great Britain.

Introduction

Understanding the barriers which prevent equality of opportunity and establishing extent of inequalities in areas such as health, income and wealth have come to the forefront of the policy agenda (Gale and Scholz, 1994; Saez and Piketty, 2014; Killewald, Pfeffer and Schackner, 2017; Black et al. 2020). Whilst the general pattern in wealth inequality has been well documented in the UK (see inter-alia Cowell, Karagiannaki and McKnight, 2018), relatively few studies have focused on trying to understand the intergenerational relationship between parents and offspring wealth. This is likely to be important for several reasons. As a cumulative stock wealth can be easily transferred to successive generations via inter vivo transfers or inheritances. Research based on UK data show the size of these transfers is non-trivial and from a lifecycle perspective individual's exhibit a strong bequest motive (Palomino et al., 2020). This would imply a strong correlation at older ages from inheritance on the death of parents. However, parents can also use their own wealth during their own lifetime, for example to act as collateral and facilitate major lifecycle decisions such as their offspring's first house purchase or in the form of early life investments such as their children's education (see inter alia Pfeffer, Killewald and Siliunas (2016)). Indeed, one recent estimate based on UK data found intergenerational transfers contribute 33% of total wealth inequality, falling to 23% after controlling for family background and highlighting the importance of attributes such as parental education (Palomino et al., 2020).

As a general pattern, people in the UK accumulate wealth primarily through housing and pension wealth up to around age 64 (retirement) and then consume some portion of that wealth through to death (see Figure 1). As such assessing intergenerational wealth offers a number of distinct challenges compared to that for earnings or incomes. Being a cumulative stock, the ideal age to assess wealth is just before retirement (mid-60s), as this represents the cumulative life-time position from working life and the potential for future consumption in retirement, unlike earnings which are an annual flow. In the absence of very long panel data it is relatively easy to observe wealth in the current population at age 64 or so, but the harder part is establishing the wealth of parents of the current population approaching retirement, as the parents were retiring 25 to 30 years in the past. Alternatively, we can look at wealth holdings of current offspring, with parents at around age 64. Here the parental wealth measure is at the ideal age but the offspring are young, around their mid-30s. In this second case the current information of wealth of offspring is reliable and valuable but there is likely to be a substantial life-cycle bias issue when observing people at young ages for wealth accumulation.

Throughout there are issues in ascertaining their parent's wealth. As with many recent surveys the British Wealth and Assets Survey (WAS) offers retrospective markers about offspring's parent's circumstances when they were adolescents (and hence parents are likely to have been aged around 40). Importantly this includes home ownership, education, economic status and family structure. It does not include, however, parental age or, perhaps most importantly for housing wealth, region of residence. Hence, we have markers related to parental wealth not true measures. Two stage two sample least squares (2S2SLS) estimation is used to address this issue and assess intergenerational wealth transmission and explore key contributions of housing and pensions. One issue here is that inheritances following the death of parents, normally after age 50, create an automatic intergenerational wealth correlation which is not captured here as actual individual wealth holding by parents is not observed, just group average wealth based on education and home ownership. So, there is a downward bias in our estimates.

In this paper we seek to explore the accumulation of wealth for the current population aged 28 to 64 across different family origins. Beyond age 45, however, selection driven by parental death becomes an issue. We then derive estimates of parental wealth for older offspring, up to age 64, under certain assumptions and discuss the life-cycle bias in the population when wealth is measured below peak wealth (age 64), using the short panel how best to think about and assess this bias. Throughout this analysis is undertaken for an intergenerational elasticity and for rank order, where biases are reduced but at the cost of not observing wealth values.

The results suggest average wealth persistence across all current age groups between 28 and 64 has an intergenerational wealth elasticity (IWE) of 0.35 and a rank-rank association of 0.3 in 2012. This lies between values seen in the US and Italy on the one hand and Scandinavian countries (see Bloise and Ratano, 2019, for a useful summary). At ages around 40, the estimate is very similar to that for earnings in the UK at 0.4 and 0.3 respectively for a cohort born at the same time (see Gregg at al. 2017). A major finding of the research is that current wealth persistence is higher for those aged 30-45 than those aged over 55 and this is despite a life-cycle bias, clear in the short panel, which means that persistence is lower at the younger ages for any cohort. By pooling our sample we compare how the IWE is changing across time for individuals at the same age born six years apart. The result is striking. We find wealth inequality using this measure is increasing by 1.26 percentage points every two years. There is, thus, very strong evidence of higher wealth intergenerational persistence in younger age cohorts. As it is already higher than for older cohorts and rising rapidly. By 2018 for those aged 32-44 the IWE had risen to 0.44 (the rank measure rises only slightly, however, showing the rise is about inequalities not ordering). This is striking in its magnitude and suggests that even on conservative assumptions of life-cycle effects, the IWE will exceed 0.5 when these cohorts reach age 64 (20 points higher than for those of that age now). The implications for wealth inequalities are profound and equally concerning is how policymakers among others, will address this issue. Simply put, wealth has increasingly begot wealth.

2. Literature

International evidence on intergenerational wealth transmission

Aggregate data suggest that housing and pension wealth tend to dominate individual's total net wealth. Financial wealth constitutes a significant component of total wealth only for individuals in the top part of the wealth distribution (ONS, 2019).[1] From a lifecycle perspective individual's tend to accumulate housing and pension wealth from their late-20s, though it has become increasingly difficult for younger cohorts to get on the housing ladder in the UK (Corlett and Judge, 2017). WAS data collected between 2016 and 2018 show that the UK similar to most advanced economies has a high level of wealth inequality: the average level of net household wealth at the 90th percentile is almost 98 times the level at the 10th percentile. Moreover, this inequality has risen over time and across successive cohorts (Bourquin, Joyce and Sturrock, 2020).

Our interest is not only to understand wealth persistence across generations at a point in time but how these sources of wealth change over the lifecycle and across different age groups. Aggregate statistics based on representative cross section survey data suggests housing wealth typically corresponds to 51% of household total net wealth, with average median housing wealth being equal to £145,000. However, almost one third of the population has zero housing wealth (Corlett and Judge, 2017). Home ownership is strongly correlated with parental home ownership and wealth (Blanden and Machin, 2017; Wood and Clarke, 2018). Whilst pension wealth is higher among older groups due to lifecycle effects, similar to housing, older cohorts have also benefited from generous defined benefit pension schemes

[1] One should distinguish between gross and net wealth when considering property and financial wealth.

which have subsequently been closed to younger generations. Pension wealth has been rising across cohorts for the same age up to those born around 1960 (D'Arcy and Gardiner, 2017).[2] Undersaving for retirement by many, has led to reforms such as auto enrolment into workplace pensions in the UK similar to other advanced economies. The data used here pre-dates these reforms.

Typically, financial wealth includes stocks and liquid savings accounts and form an important part of total net wealth for those higher up the wealth distribution. In the UK, median household net financial wealth at the 90th (10th) percentile in 2016-2018 was £92,900 (-£400) and roughly nine times the level at the median. Financial wealth is likely to be correlated with individual's background and own characteristics. For example, participation in the stock market and awareness of financial assets has been shown to be correlated with individual earnings, education and financial literacy (Guiso and Japelli, 2005; Rooij, Lusardi and Alessie 2011). From a lifecycle perspective it is important to note that unlike housing and pension wealth, financial wealth is usually liquid and as such facilitates consumption smoothing prior to retirement (Banks, Blundell and Smith 2003; Ganong et al. 2020).

Wealth affects individual's own living standards during their lifetime, especially on retirement, and that of their offspring via various channels, motivating researchers to quantify the correlation between parent and offspring wealth. This will reflect wealth directly transmitted across generations and differences in own generated wealth due to individual characteristics, such as education and earnings, which reflect childhood advantage. The fact wealth can be held in illiquid and liquid forms and is portable, combined with the fact there is large variation in parental wealth levels (Palomino et al. 2020) means the timing of such transfers is important, for example if used to facilitate a house purchase (Bourquin, Joyce and Sturrock, 2020). Using a counterfactual approach Palomino et al. (2020) consider the role of intergenerational transfers and socioeconomic background in explaining total wealth inequality in the UK, US, France and Spain. Their findings suggest over one third of total wealth inequality can be explained by these two factors alone, with intergenerational transfers explaining a relatively larger proportion.

Clark and Cummins (2014) using historical data (based on rare surnames) estimate an intergenerational elasticity between father and son wealth between 0.4 and 0.5, suggesting a

[2] It is important to note that the historic differences in pension saving between the self-employed and employees with the former group having much lower levels of pension saving and instead hold higher levels of alternative assets such as housing.

relatively high level of intergenerational transmission of wealth. International evidence based on long panel data from Scandinavian countries estimate an intergenerational rank-rank elasticity between 0.2 and 0.4 (Aderman, Lindhal and Waldenstrom (2018); Boserup, Kopczuk and Kreiner (2013, 2017); Black et al. (2020)). These studies, based on administrative data, offer the most accurate estimates of the relationship between parent and offspring wealth, and can track the relationship between parent and offspring at identical ages. Boserup et al. (2016, 2018) and Aderman et al. (2018) find a U-shaped relationship namely the rank-rank measure is higher at younger ages, declines as individuals age up until their 40s and then increases following the death of their parents. Their findings show that even in countries typically seen as egalitarian with strong redistribution policies, intergenerational transfers in early and later life are important for explaining wealth accumulation and transmission.

Going beyond one single generation, Boserup et al (2013) find grandparents play a significant role in explaining intergenerational wealth transmission even after controlling for parental characteristics suggesting a dynastic effect. Black et al (2020) and Fagereng, Mogstad and Rønning (2021) consider the role of genetic factors such as family characteristics versus environment in explaining intergenerational wealth transmission; their findings show the latter dominate, put another way wealthier families are no more talented but simply that 'wealth begets wealth'. Other studies highlight the skewness in the wealth distribution and hence the importance of the tails when considering the nature of intergenerational wealth transmission. Hansen (2014) using Norwegian data shows 60% of the wealthiest 0.1% of individuals aged 37-40 had parents in the top 1% of their respective wealth distribution in 2010, after controlling for individual's own characteristics. Whilst their study did not attempt to disentangle the channels by which such transmission takes place, the authors suggest housing and inheritances are likely to play a strong role.

Studies for the US also suggest there is a strong intergenerational transmission of wealth (Charles and Hurst, 2003). The magnitude of this relationship is generally larger than for studies based on Scandinavian data (see inter-alia Gale and Scholz, (1994); Pfeffer and Killewald,(2017); Guell, Mora and Solon, 2018). Bloise and Raitano (2019) summarise international findings, but there are data differences across the studies. Unsurprisingly, these studies show it is the same channels namely early life investment, income, inter vivo transfers and inheritance from parent to child which explain this relationship. However, these papers pay particular attention to the role of early life investments in the US given the education system, and importantly, highlight the differences in intergenerational wealth transmission between white versus ethnic minority groups (especially African American).

Understanding the mechanisms driving intergenerational transmission of social and economic outcomes among grandparents, parents and their offspring is complex. This relationship is affected not only by institutional and demographics differences but also individual and household characteristics including family background and the returns to these characteristics. Nonetheless as Boserup et al. (2013) show, even after shutting down or controlling for many of these channels, parental wealth serves as a sufficient statistic to summarise the effect these channels have on intergenerational wealth transmission.

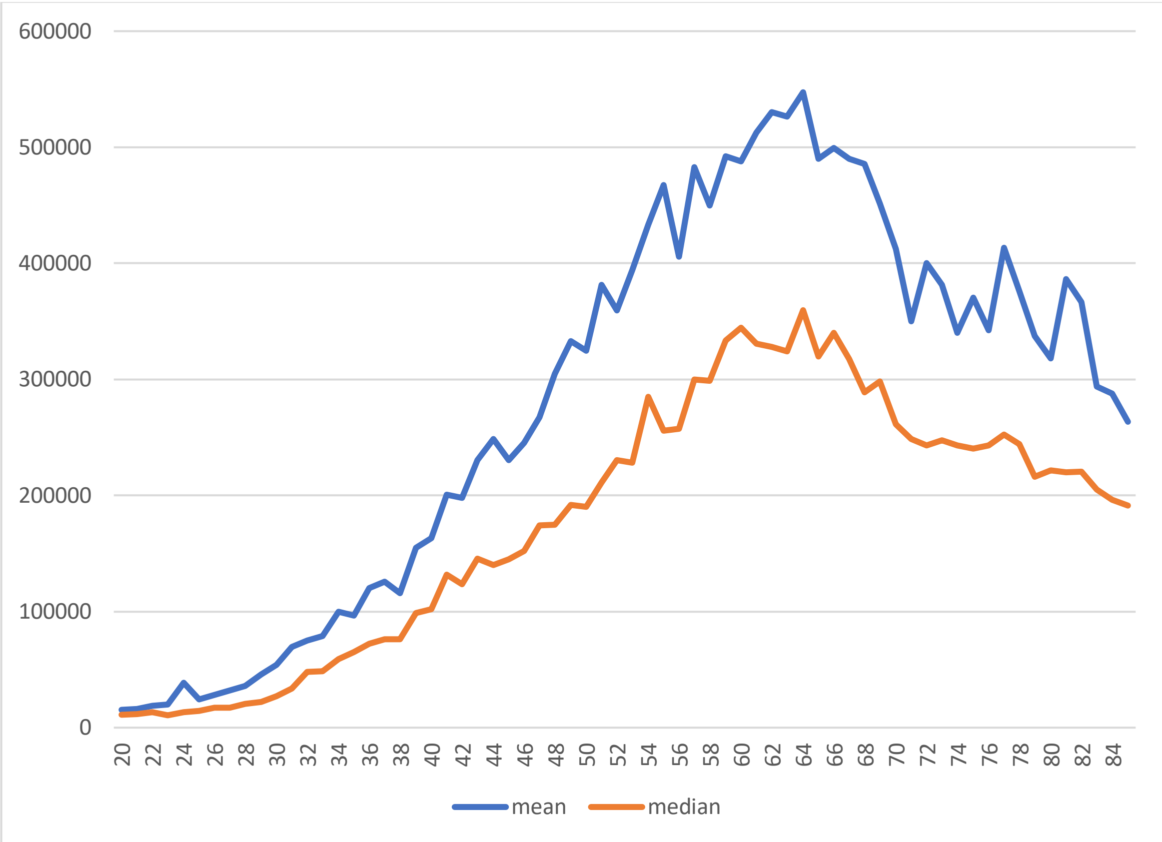
Data

Our sample is based on the nationally representative biennial Wealth and Assets Survey (WAS), managed by the Office for National Statistics (ONS, 2012). The main goal of WAS is to track changes in individual and household wealth in the British population across time and in wave 1 contained 30,000 households. The design of WAS is such that the survey oversamples wealthier households by a rate of between 2.5 and 3 times compared to other addresses. The reason for this is to address the fact that household surveys tend to inadequately capture the top part of the wealth distribution, which can distort analysis (see ONS, 2012 and Advani, Bangham and Leslie, 2020). The majority of uses waves 1-5 of WAS corresponding to the calendar years 2006-2016, as the data is collected every two years. In the final section of the paper, we also utilise round 6 of WAS (2016-18). Changes to measures collected mean that pensions and housing presence are usable from waves 1 and 2 whereas derived consistent measures of individual total and household wealth are only usable from wave 3 (2010-12) onwards.

WAS contains measures of derived individual total net wealth from contributions of housing, pension and savings plus durable assets such as cars, laptop and jewelry. Information of mortgage and non-mortgage debt is also captured. The inclusion of assets, such as cars, means that net debt is never zero or negative for those aged 25 plus. In addition to asset and debt information WAS collects detailed individual and household level economic and sociodemographic data, including retrospective information relating to individual's parent's circumstances when they were teenagers.

Figure 1 depicts average total net wealth by age based on wave 3 of WAS (2010-2012). Consistent with lifecycle profiles of wealth reported in similarly advanced economies and consistent with economic theory, Figure 1 shows total net wealth increases until individuals reach their mid-60s, where it stood at £520,000 for the mean, after which point it declines gradually. The median peaks at around £320,000 and plateaus from ages 61 to 64. We note that the average total net wealth across all ages based on our sample is £299,471.60 which corresponds to the average total net wealth of an individual aged 48.

Figure 1: average total net wealth by age based on wave 3 of WAS (2010-2012).



Notes: Figures based on WAS wave 3 (2010-2012). Y axis measures individual level total net wealth. X axis refers to age. See Appendix A for definitions. Figures quoted in 2015 prices. N=38,020.

As people age mean wealth doubles between age 29 and 35, doubles again between 35 and 42 before taking just over 10 years to double again. In the final decade before retirement there is a marked slowdown, with the level of wealth growing at around 25%. In this simple sense, the life-cycle pattern is changing very rapidly for people in their late 20s, 30s and 40s but is more modest from age 55.

Table 1 outlines descriptive statistics of main assets holdings by asset group and age. Consistent with Figure 1 which is also based on cross section data, Table 1 shows a clear upward trend in total net wealth and its subcomponents, reaching on average £533,933 between ages 60 and 64 after which we see a gradual decline. We also note that pension wealth represents the largest component of total wealth in line with aggregate statistics (Resolution Foundation, 2019) and that on average pension wealth overtakes housing wealth from age 50-54 onwards. There is likely to be strong cohort effects due to the availability of generous defined benefit (final salary) type pensions available to older groups which have since been phased out. In terms of housing wealth, this tends to increase strongly with age before peaking at around 80% of the population having housing wealth by the time individuals reach their 60s. Finally, it is worth noting that at or around state pension age close to one third of individuals report having zero pension wealth, a large proportion of this group is likely to be self-employed and must rely on other forms of wealth to fund consumption in retirement. Whereas only 20% have no property wealth.

Table 1: main assets holdings by age based on wave 3 (2010-2012) of WAS.

Age group	Total net wealth	Proportion reporting housing wealth	Proportion with pension wealth	Proportion with financial wealth	Average level of net property wealth (>0)	Average level of pension wealth (>0)	Average level of financial wealth (>0)
25-29	38,979	0.28	0.41	0.55	45,846	14,817	11,743
30-34	75,953	0.56	0.57	0.61	58,396	26,853	16,275
35-39	131,879	0.69	0.67	0.65	87,787	47,589	26,211
40-44	217,499	0.73	0.74	0.70	125,013	93,949	43,346
45-49	281,740	0.75	0.76	0.74	146,893	138,768	52,721
50-54	384,529	0.79	0.79	0.78	164,091	224,225	64,249
55-59	463,835	0.80	0.76	0.83	188,189	290,686	74,525
60-64	533,933	0.84	0.76	0.90	205,018	320,070	92,152
65-69	492,587	0.83	0.72	0.92	207,651	289,020	82,977
70-74	381,453	0.80	0.69	0.94	192,072	185,294	69,590
75-79	366,492	0.77	0.69	0.94	198,799	153,083	71,199

Notes: Definition of total net wealth, net property wealth and financial wealth can be found in appendix A. Note level figures conditioned on reporting strictly positive value (minimum £500). Figures correspond to 2015 prices.

Retrospective Questions

Our focus is on the trajectory of wealth of people as they age and the relationship with having key assets of housing and pension wealth and their value when held by differing family origins. WAS collects retrospective information relating to survey respondent's parents. These questions are age triggered and asked when an individual is age 25 or above at wave 2 or turns 25 in subsequent waves of the data. Specifically, individuals are asked to recall circumstances in their early teenage years relating to:

(1) their parents housing tenure,
(2) their parent(s) education level,
(3) whether they lived with one or both parents or some other arrangement,
(4) employment status of parents.

Unfortunately, region of parents' residence, a powerful influence on housing wealth, and parental age were not asked. [3]

These markers of parent characteristics can be thought of in two ways, they are likely to be strongly correlated with available resources of the household in which the teenager grew up (see inter-alia Bladen et al. (2013), Jerrim and Macmillan, (2015) and Gregg et al. (2017)) and correspond to wealth accrual by family origin. Alternatively, as wealth accrual will continue after a young adult has left home (Pfeffer Killewald (2017); Boserup, Kopczuk and Kreiner (2017); Aderman, Lindhal and Waldenstrom (2018); Black et al. (2020)), the age at which these were collected is not the focus but rather they are markers for assessing relative wealth position of the parents. Put another way, we need to assess if the characteristics are largely stable between when a child was aged 14 or so and parents are thus in their 40s to when the parents reach age 64 and peak wealth. With this stability the measures reflect differences in wealth holding across groups at ages 40 through to 64. This presents three methodological challenges which must be addressed. First, we do not observe true wealth of parents but rather proxy

[3] The questionnaire wording is as follows: "We are interested in how living standards compare across the generations so the following questions are about your family and parents. I'd like you to think back to when you were a young teenager, say between the ages of 12 and 16." An additional question also asked about presence of siblings which is not utilized for the purpose of this study.

markers. Second, these are not measured at around the time of peak wealth but when parents were aged around 40 and third, for most of the offspring sample we observe their true wealth well before they have reached peak age.

Methodology

Starting from wave 3 onwards (2010-12), WAS released consistent measures of individual total wealth and its subcomponents including but not limited to housing wealth, pension wealth and financial wealth. The definition of these variables is described in appendix A**.** In terms of using wealth data for regression analysis, research shows two issues should be addressed (Pence, 2006). First, there is a large literature documenting that wealth data has a long thick right hand tail where some very high values can lead to misleading conclusions when assessing at the mean, such as with OLS and hence some analysis across the distribution will be important (Killewald et al, 2017). Unlike a lot of wealth data, WAS total *net* wealth is not zero or negative, except for a very small number of individuals at young ages, because a wide range of assets including durable goods are included.

It is important to note that key sub-components of total wealth, such as housing wealth and pension wealth are zero for many individuals, especially at younger ages and this value is economically meaningful. So, log transformation cannot be applied beyond considering total net wealth. However, as demonstrated by Pence (2006) and more recently by Ravallion (2017) transforming the data by applying the Inverse Hyperbolic Sine (IHS) for wealth values greater than or equal to zero allows one to estimate wealth regressions including all available data.[4] Depending on the specification the coefficients from these types of regressions can be interpreted as a type of elasticity (Bellemare and Wichman, 2020).

Starting with current wealth in offspring generation and retrospective measures of parental wealth markers Equation (1) specifies the ideal regression form assessing the relationship between offspring's wealth and parent's characteristics:

$$LogW_{offspring\ 64} = \alpha + \beta\ LogWh_{parent\ 64} + \varepsilon \tag{1}$$

[4] IHS is approximately equal to log(2yi) or log(2)+log(yi) except for very small values and can be interpreted (in regression) in exactly same way as log. Bellemare and Wichman (2020) note caution of using IHS transformation on very small values(<10) in data which given our measure of total wealth is not applicable.

Where:

$W_{offspring}$ 64 is true adult children's wealth at age 64 just on retirement, without reporting error.

$Wh_{parent64}$ is likewise wealth of parents also when they were aged 64, just before retirement of the main earner but unlike for offspring this is a household measure and without reporting error.

The data to estimate Equation 1 require extremely long panel data at both individual and household level, where both generations have reached retirement, such data is not readily available in the UK. The closest available is based on the study of Wills across generations, though this normally well after peak wealth holding at 64 (Clark and Cummins, 2014).

As discussed above the data available has three substantive data issues which will deviate from this ideal. First, as discussed, parental wealth is not directly observed but through a limited set of proxy indicators. Consisting of a vector of five groupings of parent's characteristics based on education level interacted with housing tenure status. Second the offspring children are younger than age 64 and peak wealth, and third the parents (not observed) are also likely to deviate from the age of peak wealth, which is just on retirement. These will create issues of measurement error and hence attenuation bias and life-cycle bias follow from the age issues (see inter-alia Dearden, Machin and Reed (1997); Haider and Solon (2006)), for discussions of these respective biases in the context of intergenerational earnings).

Developing models to address these in turn Equation (2) specifies the relationship of interest:

$$logW_{offspring\ 28-45} = \pi + \beta logW_{parent\ 58-75} + \vartheta \qquad (2)$$

Where:

$W_{offspring\ 28-45}$ is adult children's wealth at the respective ages. Beyond age 45 there is little data for parents of adult children. $W_{parent\ 58-75}$ then represents the wealth of parents aged 30 years older than the offspring. This is not directly observed, however, rather we have

X_{wealth_parent}= parent's observed characteristics related to wealth at these ages

These are the markers of family origin and Figure 2, in the results section, documents offspring wealth over the life course by these markers.

To attach wealth values to these parental groupings we adopt the Two Stage Two Sample Least Squares (TSTSLS) estimator. This was first used in the intergenerational context by Björklund and Jäntti (1997). We apply two sample two stage least squares using a sample of adults in WAS who are 30 years older than the offspring generation. Such that the unobserved wealth of parents is predicted, $Log\ \widehat{W}_{parent\_wealth}$, from their characteristics X_{wealth_parent} derived from another sample within the WAS dataset where both are observed.

In Equation 3 the estimated β under TSTSLS deviates from the Equation 1 such that when actual wealth of parent's is not observed then the following parameters are estimated:

$$Log\ W_{offspring} = \xi + \beta_1 Log\ \widehat{W}_{parent\_wealth} + \gamma \tag{3}$$

Where

$$Plim\beta = \frac{\sigma_{\widehat{w}p,ow}}{\sigma_{\widehat{w}p^2}}\ which\ under\ TSTSLS\ becomes\ Plim\beta_{TSTSLS} = \frac{\sigma_{\overline{\text{xw}},ow}}{\sigma_{\overline{\text{xw}}^2}} \tag{4}$$

Where σ_{xw} (σ_{ow}) refers to the standard deviation in parents (offspring) wealth. A hat denotes the predicted value based on alternative survey data, given we do not directly observe parent's wealth but instead estimated it using the following equation:

$$Log\ \widehat{W}_{parent\_wealth} = \lambda + \omega X + \varphi \tag{5}$$

Where our dependent variable is parent's total wealth from a sample of the appropriate age between 58 and 75, and X is the vector of characteristics (in our case housing tenure and education interacted) from the retrospective questions.

Measurement error and Attenuation bias

Reporting error or transitory fluctuations mean that a measure of earnings in the intergenerational earnings literature or wealth in this case, creates inconsistent estimates of the β from Equation 1. With classical measurement error in the RHS variable (parental wealth) the result is a downward attenuation bias in the estimates resulting from this measurement error. Several early papers in the earnings mobility literature were concerned with addressing this bias. The preferred approach to addressing this is averaging over repeat observations for the same individuals. For long panel data this is often not available in the parental generation. However, it is regularly available in administrative data widely available in Scandinavia (Aderman, Lindhal and Waldenstrom (2018); Boserup, Kopczuk and Kreiner (2013, 2017); Black et al. (2020)). The alternative approach is to predict earnings with markers of permanent differences in characteristics associated with earnings such as education, occupation, and industry. Dearden, Machin and Read (1997) undertake this for the UK in the NCDS 1958 birth cohort using markers from within the same sample. TSTSLS described above does the same but using earnings or wealth predicted in a separate data sample. Jerrim, Choi and Rodriquez (2014) show there is an upward bias to estimates when there are a limited set of predicting variables because of the reduced variance $\sigma_{\overline{XW}}$ compared to σ_{XW} is not offset by the increase co-variance in the numerator $\sigma_{\overline{\text{XW}},OW}$ from purging of the measurement error. Given our restricted set of predictors for parental wealth this is likely to be an issue. But as Jerrim et al. (2014) note the Rank-Rank regression approach is not subject to this variance reduction issue and hence provides an accurate estimate of the intergenerational rank correlation. So, the Rank-Rank regression is more efficient but does not capture the extent of wealth inequalities across generations, just the degree of re-ordering of individuals. Put another way, the intergenerational β should be thought of as an upper bound estimate. The lower bound for β is the Rank-Rank estimate but realistically given the large wealth inequalities in the UK it will lie above that.

A recent set of papers analysing intergenerational wealth transmission discuss whether only focusing on associations in wealth between parent and offspring is sufficient for fully understanding the extent of this relationship. Specifically, these papers highlight the role of grandparents or multigenerational transmission (see Boserup et al. (2013); Pfeffer and Killewald, (2017)).[5] [6] Unfortunately given the data available we cannot empirically test the role of grandparents in explaining intergenerational wealth transmission.

[5] Boserup et al (2013) contest no single measure of IWE exists because different sources of variation in parental characteristics translate into different strengths of intergenerational association.

[6] Solon (2018) concludes the evidence on assuming an AR1 versus a higher order model is still very much mixed and under researched: there is no prior reason to expect grandparents to play a key role in the mobility process and that the effect is context, culturally and time dependent. From a modelling perspective assuming an AR1 process implies the intergenerational correlation dies at a geometric rate. Solon (2018) discusses this issue alongside measurement error more generally and notes that if ignored will lead to spurious positive regression coefficients (for the estimated grandparent effect). Various solutions have been proposed in the literature including IV approaches and utilising administrative data sources (see inter-alia Chetty et al. (2014) and Lindahl et al. (2015)).

Life-Cycle Bias

The parental and offspring generation are assumed to be 30 years apart for the purposes of the TSTSLS estimation of parental wealth in Equation 5. Given diminishing sample and likely selection, the upper age we undertake TSTSLS for is 75 for the parental generation and hence, age 45 for the offspring. As the peak age for wealth holding is just before retirement, around age 64, both generations will be away from this optimal age to the degree that wealth holdings diverge from the peak. Figure 1 shows that this divergence is very rapid at both younger and older ages.

Haider and Solon (2006) and Bohlmark and Lindquist (2006) show that in the offspring generation the lower inequality in earnings at younger ages produces a downward life-cycle bias to estimates of the β. This is reflected by the regression coefficient where life-time earnings is regressed on point in time earnings lies below 1. Earnings in a person's late 30s gives an unbiased estimate of the intergenerational β and in the mid-40s estimates are upward biased. The expansion of wealth inequalities as people move closer to retirement, see Figure 2, means this is also likely to hold true for wealth and to continue through to retirement age. However, Boserup et al. (2016, 2018) and Aderman et al. (2018) find a U-shaped relationship namely that the rank-rank measure is higher at younger ages, declines as individuals age up until their 40s and then increases following the death of their parents. So, the underlying ordering of people by own and parental wealth holdings is heavily influenced by bequests and need not have the same age relationship as the amounts of wealth held. In Rank-Rank regression life-cycle biases are much smaller as inequalities have no influence, just the rank ordering (see Gregg et al. 2017 for UK evidence on this for earnings).

We undertake two counterfactual exercises, one for each generation, to illustrate how changes in inequalities of wealth across the life-course will influence estimates. In both cases we predict wealth at age 64, based on current position in the wealth distribution but attach values derived from the sample of current 64 year olds, when inequalities in wealth holdings are greater. So, people at the top of the parental wealth distribution (highly educated homeowners) aged 58 to 75 have current wealth replaced with the values for this group currently aged 64. This is, thus, just changing the age for the TSTSLS estimation. It is not a prediction of what their wealth will be (or was) at age 64, but rather what differences in wealth inequalities at different ages do to estimates. As such the Rank-Rank estimates is unaffected by this, as the rank ordering across our vector of parental characteristics is stable at these ages. As parental characteristics are observed even if deceased, we can attach these values to all parents, including those who would be aged over 75. This then offers a common approach to estimating intergenerational wealth patterns for offspring for all ages, not having to stop at age 45. We then undertake the same exercise for the younger generation, we take the Rank order at the current age and attach the wealth values for people at that rank for the age 64 sample. This then assumes rank stability but allows inequalities to widen and shows what effect it has on estimated wealth persistence across generations.

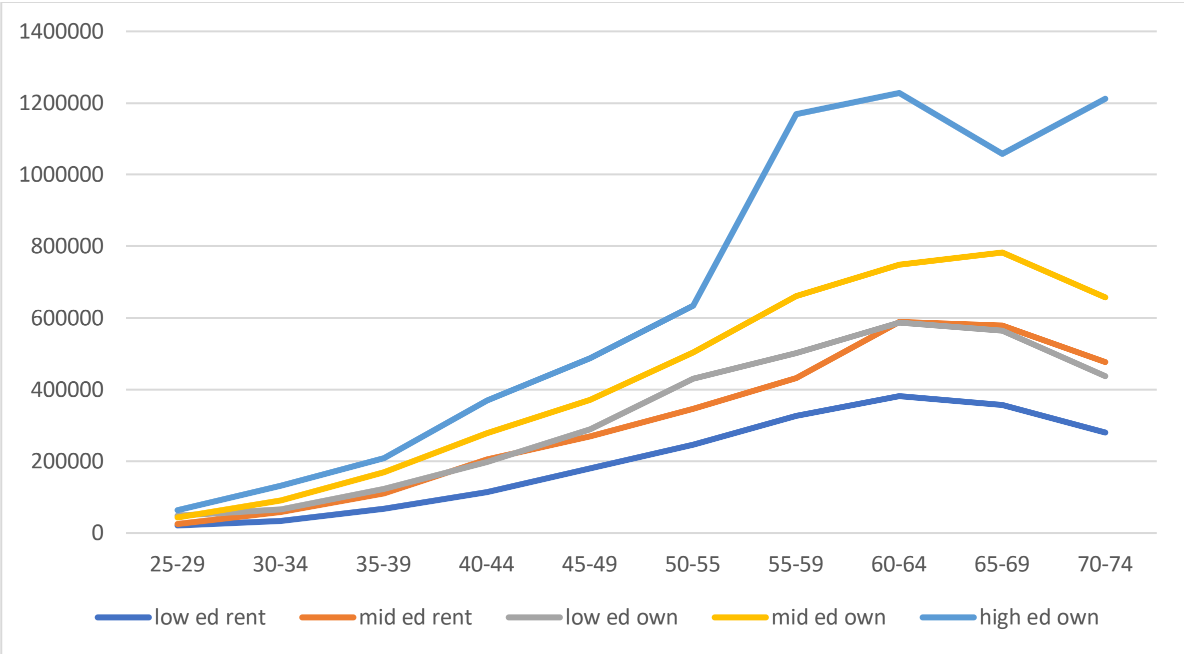
These estimates for different age groups will both reflect life-cycle differences across age but also differences across cohorts. Finally, to explore life-cycle changes within cohorts we utilise the short panel. Over 4-year periods we can observe the evolution of the estimated intergenerational β and the Rank correlation as people age and by a chain extension assess the picture over the life-course. Finally, we pool wave 3 and round 6 of WAS to compare how the IWE is changing across the 6-year period between survey waves (2010/12-2016/18) for individuals at the same age except born 6-years apart. This allows us to compute an annual measure of the rate of change for the IWE.

Descriptive Evidence

Figure 2 gives the cross-sectional total net wealth by age for a period just after the financial crash, which corresponds to Wave 3 of the survey. This is due to wealth definitions changing between Wave 1 and 3 making earlier data not comparable. Figure 2 shows a clear fanning out across the life course in total net wealth reported by survey participants parental background, according to the education and home-ownership status of their parents. The top category, those with highly educated (degree level) parents who owned their own home when the study participant was aged around 14 (thus the parents were aged in their early 40s) shows a steady pulling away from other groups up to age 50, at which point their total net wealth is around 50% more than middling wealth groups. This increases significantly-up to double the typical wealth of others with less advantaged parents. One could posit that this jump corresponds to a large transfer such as inheritance, however Figure 2 is based on a cross section data only, so levels of wealth reported is based on information from different participants in the survey with slightly older parents. For example, the parents of those aged 50 in 2010 to have a degree would have gone to university in the 1940s/1950s, before the first major expansion of university places in the 1960s. The study participants would have been looking to gain access to the housing ladder in their 30s in the 1990s before the large shift in house prices relative to earnings. So, the differences may reflect different cohorts as much as different life stages. We exploit the panel dimension of WAS to understand this in a later section of the paper.

Figure 2 then gives a sense of wealth accrual by parent's characteristics and demonstrates the importance of both parent's education and home ownership status. The offspring of low educated parents who owned a home have similar wealth as those with medium/highly educated parents who were renters. Although for most cohorts those with low educated owner occupier parents have slightly higher wealth. At age 60-64 with highly educated owner occupier parents have on average three times the net wealth of those with low educated renter parents. Overall, the wealth gap between the highest and lowest category is £800,000.

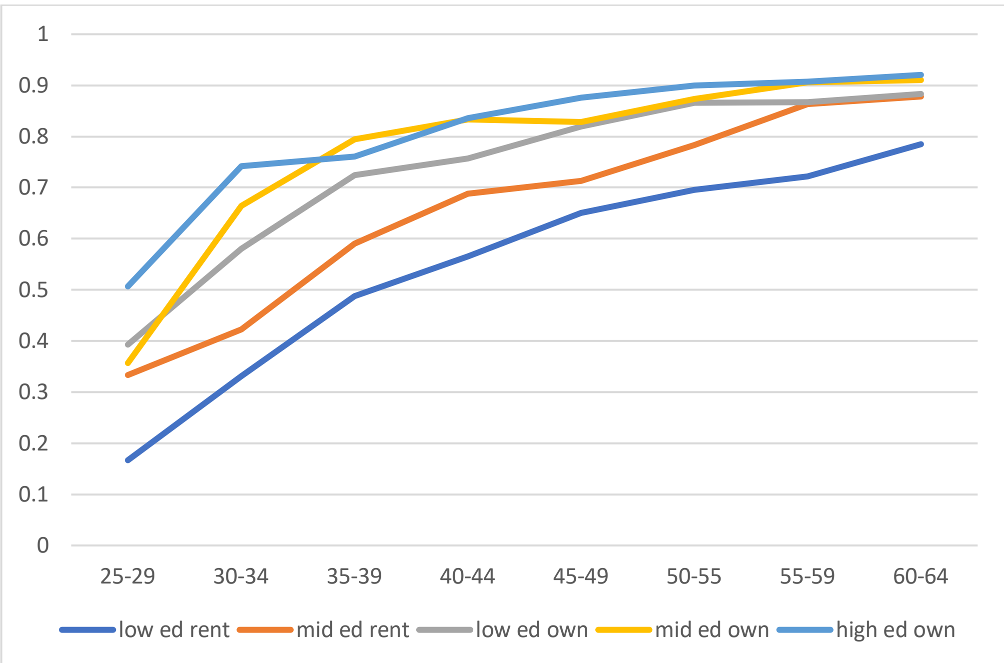
Figure 2: Net wealth among all individuals aged 25-64 by parent's education and home ownership status.



Notes: estimates based on Wealth and Assets Survey wave 3 (2010-2012). X axis refers to age groups and Y axis net wealth. Legend corresponds to 5 groups based on parental housing and education characteristics. Figures quoted in 2015 prices.

As the bulk of wealth for most people comes from housing and pension wealth, we next describe the holding of these assets by age group. Figure 3 shows the proportions of those who report (net positive) property wealth from their principal or additional property by parental background for 5-year age groups. Between 80 and 90% do so by age 60-64, with only those with low educated renter parents showing levels much below 90%. Thus, the vast majority of individuals born circa 1950 who grew up in rental accommodation report owning property by age 64. This cohort then had very different housing opportunities than their parents which could be considered as massive upward absolute mobility in housing wealth, for evidence on cross cohort differences in home ownership in GB see inter alia Bangham (2019). Accounting for such structural changes is important in the context of assessing long run intergenerational wealth inequality in France and the UK as recently evidence by Bourdieu et al (2019) and Cowell et al (2018) respectively. The lower rates of home ownership for younger age groups will thus reflect a combination of life-stage and that younger cohorts do not have same home ownership opportunities. The gaps in peoples early 30s by our family background types is of the order 40 percentage points, with double the levels of homeownership between the most and least advantaged groups. These gaps are 4 times that seen among those aged around 64. This massive difference is unlikely to be driven by life-stage but by differences across cohorts, as demonstrated by Blanden and Machin (2017) and Wood and Clarke (2018). This will be further explored using the panel aspect of the data.

Figure 3: Proportion reporting net positive housing wealth by age and parent's education and housing tenure.



Notes: Proportion based on having net property wealth (defined in appendix A). Estimates based on wave 3 of WAS (2010-2012). Legend corresponds to 5 groups based on parental housing and education characteristics.

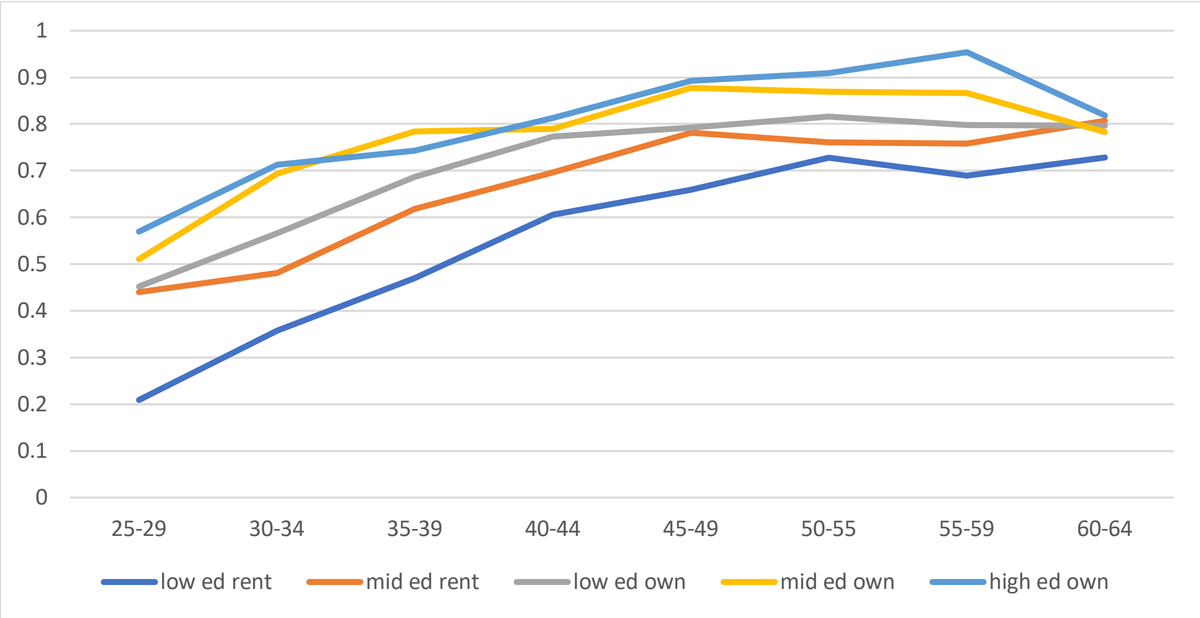
A recent ONS (2019) report shows pension wealth (closely followed by housing wealth) is on average the largest subcomponent of total individual wealth prior to retirement, and the fraction of total net wealth this component explains becomes increasingly important higher up the wealth distribution. Figure 4 explores pension wealth holding by age group. We purposely use sample data corresponding to a period prior to the introduction of Auto Enrolment, which was introduced in October 2012.[7] As for housing, the differences by age group will in part reflect individual's life stage and different birth cohorts. Therefore, the decline in pension wealth holding between 55-59 and 60-64 observed for higher education groups, is most likely not people losing pension access but that the slightly younger cohort had greater chances to accrue pension access.

We note the relatively low proportion of individuals especially between ages 25 and 50 who report having pension wealth conditional on growing up in a low educated renter household. The gaps in pension saving in peoples 30s is again double (35 percentage points) for those from more advantaged backgrounds compared to the least advantaged.[8] Again these gaps are far larger for those in their 30s than 60s. Even if the curves converge somewhat at later ages, the nature of pension wealth is such that accrual (conditional on having a positive amount) is relatively slow compared to say housing wealth. Hence starting earlier is very valuable. Indeed, even policies such as Auto Enrolment whose objective it is to increase higher pension coverage (and to some extent contribution rates), will not address the gap in pension wealth between these groups. Thus, underlining the importance of distinguishing between having and not having and conditional on the former, the level of pension wealth.

[7] Auto Enrolment is a policy which aims to boost workplace pension coverage and contribution rates, evaluation of this policy suggests it has been largely successful (see Cribb and Emmerson, 2019).

[8] Whilst it is possible that some of this gap may be explained by differential selection into particular labour force status, for example a higher proportion of individuals from low educated renter households could be self-employed (who typically save for retirement via housing or business assets) this unlikely to explain the entire gap observed in the data.

Figure 4: Proportions reporting Pension Wealth by age and parent's education and Housing tenure.



Notes: Proportion based on having pension wealth (defined in appendix A). Estimates based on wave 3 of WAS (2010-2012). Legend corresponds to 5 groups based on parental housing and education characteristics.

We next consider how total wealth trajectories vary over the life course by estimating the mean level of total net wealth by parent's housing tenure and education.

Estimation results

Figure 2 showed the changes in total net wealth by family background across age groups, highlighting how inequalities widen for older groups, especially among those in their 50s before narrowing again after retirement. Table 2 below, shows TSTSLS estimates of the intergenerational β and Rank-Rank regression for age groups, imputing parental wealth for our measures of family origin based on current populations aged 30 years older than the offspring generation in Wave 3 of the WAS survey (from equation 3). The age groups are at 4-year intervals to match our analysis using the panel dimension of WAS in the later part of the paper. Table 2 then gives cross-section estimates of intergenerational wealth associations for contemporary younger generations up to the age of 44. We do not extend analysis beyond this age because the data on parental wealth will be unduly affected by sample selection from rising mortality.

Between ages 26 and 44, the intergenerational log-log regression coefficient, β, which reflects how strongly wealth is correlated across generations increases from 0.26 to 0.41 and the rank correlation from 0.19 to by 0.3. The β is likely to be upward biased by the low variance in the imputed parental wealth based on a limited set of parental markers. The Rank-Rank correlation does not suffer from this bias and as such forms a lower bound of the underlying relationship, as a rank based estimator does not capture the effects of the high wealth tail on intergenerational patterns. The results suggest that 30 to 40% of wealth differences between parents are passed across generations for people in the 40s. This could well be young for assessing life-time inequalities as offspring are still 20 years off of peak wealth. For these ages it also suggests that transmission of wealth is essentially by a similar order of magnitude as estimates of intergenerational income/earnings associations, on both measures, for a cohort born around 1970 and aged 46 in 2016 (see Gregg et al. 2016).

Table 2: Intergenerational elasticity based on wealth level and rank by age (current offspring and parent age) log-log regression.

Specification	Offspring=27-29, parent=58	Offspring=31-33, parent=62	Offspring=35-37, parent= 66	Offspring=39-41, parent=70	Offspring=43-45, parent = 74
Contemporaneous					
B	0.26*** [0.04]	0.43*** [0.04]	0.35*** [0.04]	0.38*** [0.04]	0.41*** [0.04]
Rank-rank	0.19*** [0.04]	0.33*** [0.03]	0.27*** [0.03]	0.29*** [0.03]	0.30*** [0.03]
N_offspring	502	717	885	1064	1178

Notes: ***, **,* refers to significance at 1%, 5% and 10% level respectively. Robust standard errors reported in parenthesis. Second row corresponds to regression of offspring total net wealth (within three year age band defined in column heading) on parent's wealth proxied by individual's in sample who are approximately 30 years older than offspring. Third row refers to same specification except total wealth measures are now ordered by rank (both offspring and parent). In level specifications both offspring and parent total net wealth values have been log transformed.

Wealth typically peaks just before retirement, around age 64, before being used to facilitate consumption in older ages, post retirement. Wealth holding at age 64 therefore represents both peak wealth and the driver of subsequent living standards. It is therefore the key age for assessing wealth holdings and generational persistence. Table 3 adjusts current parental wealth across the groupings observed to align with peak wealth. This is undertaken by replacing current parental wealth with mean wealth holdings for those at age 64 across the family background groups. This is not a prediction of wealth gaps for these cohorts when they reach (or were) age 64 but an illustration of what the changes in wealth inequalities among 50+ age groups has on the picture of intergenerational wealth by giving the wealth values for each group as those for current 64 year olds. It also allows us to give a value to parental wealth for those where parents are aged over 75 or even deceased, where current wealth holding for our groupings might be subject to bias from only being observed for those still alive. We can therefore give values for parental wealth for offspring at older ages than 45. In this case the rank measure is unchanged as there is no rank re-ordering among these age groups across our limited measures of parental background.

The effect of this simulation is very small for the younger age cohorts with estimates holding around 0.38 in 2012. When we extend the analysis to age 64 for the offspring generation, what is striking is that for cohorts in their 60s now intergenerational wealth associations are much lower at 0.3. This lower IWE at older ages needs to be investigated further as it runs counter to the rising inequality of wealth with age seen in Figures 1 and 2. The Rank-Rank estimates are broadly stable at just over 0.3 across all age groups. Pooling the ages together to provide a single average estimate of intergenerational wealth holding for prime age people produces estimates of 0.343*** (0.014) for the log-log IWE and 0.308*** (0.010) for the Rank-Rank regression. This gives a fairly tight range for intergenerational wealth persistence and places the UK between the US and Italy and the Scandinavian countries internationally (Bloise and Raitano, 2019).

Table 3: Intergenerational elasticity based on current wealth level and rank by age (taking parents to peak wealth at age 64) log-log specification.

Specification	Offspring age 27-29	Offspring age 31-33	Offspring age 35-37	Offspring age 39-41	Offspring age 43-45
β	0.29*** [0.05]	0.41*** [0.04]	0.38*** [0.04]	0.38*** [0.04]	0.38*** [0.04]
Rank-rank	0.17*** [0.04]	0.33*** [0.03]	0.27*** [0.03]	0.28*** [0.03]	0.30*** [0.03]
$N_{offspring}$	502	717	885	1064	1178

	Offspring age 47-49	Offspring age 51-53	Offspring age 55-57	Offspring age 59-61	Offspring age 63-65
β	0.34*** [0.04]	0.30*** [0.03]	0.39*** [0.03]	0.28*** [0.03]	0.31*** [0.03]
Rank-rank	0.31*** [0.03]	0.27*** [0.03]	0.39*** [0.03]	0.32*** [0.03]	0.37*** [0.03]
$N_{offspring}$	1216	1189	1194	1308	1550

Notes: ***, **,* refers to significance at 1%, 5% and 10% level respectively. Robust standard errors reported in parenthesis. Second row corresponds to regression of offspring total net wealth (within three year age band defined in column heading) on parent's wealth at peak age 64 proxied by individual's in sample who are approximately 30 years older than offspring, thus assuming rank stability holds between parent's age and peak age (64). Third row refers to rank-rank specification where offspring total wealth is ordered by rank and parents rank is based on wealth of individuals aged 64 and ordered by five parental groups. Both offspring and parent total net wealth have been log transformed. Number of parents equal to number of offspring by construction.

Table 4 reports intergenerational log-log and rank-rank regressions addressing life-cycle bias in the offspring generation. The approach taken is simply to say those at the top and bottom of the wealth distribution stay in such positions but the wealth (dis-)advantages of being in such positions are replaced by those of the older age group. This then assesses a case where those with unusually high wealth at younger ages to stay in these privileged positions. This is thus assuming rank stability, which is broadly defensible for older age groupings but less so at younger ages. We apply parental wealth in the way described above for Table 3.

Table 4: Intergenerational elasticity based on predicted wealth level and rank at age 64 by age (also taking parents to peak wealth at age 64 as in Table 3) Log-Log specification

Peak on peak estimates based on predicted wealth at 64 using Original Rank Position					
Specification	Offspring age 27-29	Offspring age 31-33	Offspring age 35-37	Offspring age 39-41	Offspring age 43-45
β	0.31*** [0.06]	0.42*** [0.05]	0.39*** [0.05]	0.36*** [0.04]	0.32*** [0.03]
Rank-rank	0.17*** [0.04]	0.33*** [0.03]	0.27*** [0.03]	0.28*** [0.03]	0.30*** [0.03]

$N_{offspring}$	502	717	885	1064	1178
	Offspring age 47-49	Offspring age 51-53	Offspring age 55-57	Offspring age 59-61	Offspring age 63-65
β	0.31*** [0.03]	0.27*** [0.03]	0.34*** [0.03]	0.28*** [0.03]	0.31*** [0.02]
Rank-rank	0.31*** [0.03]	0.27*** [0.03]	0.39*** [0.03]	0.32*** [0.03]	0.37*** [0.03]
$N_{offspring}$	1216	1189	1194	1308	1550

Notes: Parent's wealth based on 5 groups (housing/education) and parent rank imputed based on current 64-year olds with same mix of characteristics. Both offspring and parent total net wealth have been log transformed.

The difference made by this adjustment to own wealth are surprisingly small and only accentuate the sense that the beta is lower for older age cohorts than for younger ones. The picture for rank-rank regressions is unchanged as this approach is primarily addressing wealth inequalities rather position in the distribution. In summary, these suggest that either the life-cycle bias in estimating intergenerational wealth transmission is such that it diminishes with age or somewhat more concerning, that intergenerational wealth inequalities are widening sharply in younger compared to older age cohorts. We will verify the underlying story using the short panels available in WAS, next. What our approach misses, however, is the direct intergenerational association from inheritances, which arrive principally between the ages of 50 and 70. This will push up estimated correlations for older age groups as found in recent studies based on Scandinavian data (see inter alia Boserup et al. (2016, 2018) and Aderman et al. (2018)). This will be explored in future research but will also be implicit in the panel based modelling in the final sections of the paper.

The estimated persistence in rank ordering, which has the least modelling assumptions, is remarkably stable across the cohorts and specifications considered at just over 0.3 and consistent with research estimating intergenerational rank correlations based on US and Scandinavian data (Pfeffer Killewald (2017); Boserup, Kopczuk and Kreiner (2017); Aderman, Lindhal and Waldenstrom (2018) and Black et al. (2020)). We note that Rank-Rank earnings regressions for the UK using a cohort that was aged 40 in 2010 which coincides with the wave 3 sweep of WAS was not dissimilar at around 0.3 (Gregg et al.

2016). Secondly, whereas within a cohort the estimated persistence in earnings across generations rises with age for men up to age 40 or so, for wealth it appears broadly flat. In addition, there is a life-cycle bias when earnings are measured too young that results in understatement of the true intergenerational correlation (Haider and Solon, 2006), which is not apparent in wealth modelling described above. However, we are not looking at one cohort as they age but different cohorts at different ages.

The most notable finding in Table 4 is the difference between the stability of the rank order measure across cohorts and the lower intergenerational correlations in wealth values. These measures tend to be similar in the middle of the distributions, as the distances between people in the order observed are broadly similar. However, in the upper and lower tails the differences in wealth become more stretched and the two concepts diverge. To explore this across cohorts Table 5 looks at the family origin position (median rank in the parental distribution) of the least and most wealthy 10% of offspring for each age group. As might be expected those who form the least wealthy 10% of the population come from ever increasingly deprived family origin as we consider older age groups. So, whilst people in their early 30s with the least assets are drawn from around the 27th percentile of parental wealth at age 55+ this is just the 13th percentile. There is a very strong persistence for the poorest (meaning very low wealth here) adult children coming from the poorest families (which in our setup means renting parents with low education). What is surprising is the same pattern of growing reinforcement of advantage with age does not apply to the wealthiest 10% of the adult offspring. Rather the reverse, among older age groups the wealthiest offspring are not especially drawn from the wealthiest parents (high educated home owners) in the way they are in younger cohorts. When interpreting these findings, one should note that the well educated home owner group is smaller as a share of the sample for parents in older cohorts and hence the wealthiest offspring are less able to be concentrated on this small minority. We use the panel dimension of WAS to get a clearer understanding of the life cycle bias and what this means for wealth mobility across cohorts. But prima facae evidence suggests very strongly that among younger cohorts the most wealthy are drawn far more heavily from those with wealthier parents than for older cohorts. So, although the rank ordering as a whole is not changing much, at the very top which matters heavily in estimating the IWE, it has.

Table 5: Parental rank by age at top and bottom decile of offspring wealth distribution

Offspring wealth	Offspring=27-29, parent =58	Offspring=31-33, parent =62	Offspring=35-37, parent = 66	Offspring=39-41, parent =70	Offspring=43-45, parent = 74	Offspring=47-49, parent ≈ 78	Offspring=51-53, parent ≈ 82	Offspring=55-57, parent ≈ 86	Offspring=59-61, parent ≈ 90	Offspring=63-65, parent ≈ 94
10^{th} percentile or below	0.41	0.26	0.27	0.29	0.22	0.19	0.19	0.13	0.14	0.12
90^{th} percentile and above	0.55	0.58	0.48	0.53	0.49	0.43	0.44	0.41	0.42	0.37
$Total\ N_{of}$	568	7869	963	1150	1178	1316	1299	1313	1417	1675

Notes: First row corresponds to average rank of parental wealth (at peak age 64 imputed from a regression of total net wealth on education and housing) for offspring of various ages (defined in columns) whose wealth is at the 10^{th} percentile or below in the relevant offspring wealth distribution. Second row refers to equivalent rank but in this case among offspring in 90^{th} or above percentile in relevant distribution.

Table 6 compares our estimates of intergenerational wealth transmission based on cross section and the balanced sample for the short (4 year) panels based on WAS waves 3 to 5, as there is considerable attrition in the data, we don't extend to 6 years except using the unbalanced panel later. The measures in the full and balanced panel samples are in line with each other but there are some fluctuations across cohorts. Table 6 shows that the cohort centered on age 40 has a balanced panel sample estimate just below the full-sample and age 44 cohort just above. More importantly the table shows how estimates of intergenerational wealth transmission move over the four years for a fixed sample as the cohort ages. The panel estimates clearly rise as a cohort ages when comparing rows 4 and 5, for the same people 4 years older. This is especially marked between ages 32 and 48. This increase in the estimated persistence with age is very much in line with the earnings mobility literature, but for earnings the highest values typically plateau once individuals reach their late 30s but here show continued rises up to age 64. The magnitudes are very large with each 4 year panel estimate rising by an average of 5 points for cohorts aged between 32 and 64. Therefore, the panel evidence is clear that the IWE is rising as people age which is not visible in the cross-sectional estimates. This is an important finding in its own right, as it suggests that differences across the cohorts in intergenerational wealth associations are strong enough to overturn the underlying life-cycle bias, which pushes up the IWE as people age. The same pattern applies to rank-rank associations, comparing rows 8 and 9, which also are clearly rising in the panel. Though the rise is less marked.

Table 6: Intergenerational elasticity and rank relationship based on cross section and 4-year panel by age (log-log and rank-rank specifications).

Age group at wave 3 (central birth year)	27-29 1988	31-33 1984	35-37 1980	39-41 1976	43-45 1972	47-49 1968	51-53 1964	55-57 1960	59-61 1956	63-65 1952
Log-Log										
β cross section full sample wave 3	0.29*** [0.05]	0.41*** [0.04]	0.38*** [0.04]	0.38*** [0.04]	0.38*** [0.04]	0.34*** [0.04]	0.30*** [0.03]	0.39*** [0.03]	0.28*** [0.03]	0.31*** [0.03]
β balanced panel wave 3	0.28*** [0.08]	0.41*** [0.06]	0.39*** [0.06]	0.36*** [0.06]	0.41*** [0.06]	0.33*** [0.05]	0.29*** [0.04]	0.42*** [0.04]	0.27*** [0.03]	0.31*** [0.03]
β balanced panel wave 5	0.25*** [0.08]	0.56*** [0.06]	0.45*** [0.07]	0.44*** [0.06]	0.44*** [0.05]	0.40*** [0.05]	0.32*** [0.05]	0.42*** [0.04]	0.31*** [0.03]	0.32*** [0.03]
Rank-Rank										
rank cross section full sample wave 3	0.17*** [0.04]	0.33*** [0.03]	0.27*** [0.03]	0.28*** [0.03]	0.30*** [0.03]	0.31*** [0.03]	0.27*** [0.03]	0.39*** [0.03]	0.32*** [0.03]	0.37*** [0.03]
rank balanced panel wave 3	0.14** [0.07]	0.34*** [0.05]	0.31*** [0.05]	0.29*** [0.04]	0.31*** [0.04]	0.30*** [0.04]	0.28*** [0.04]	0.39*** [0.04]	0.34*** [0.04]	0.38*** [0.03]

rank balanced panel wave 5	0.20*** [0.06]	0.41*** [0.04]	0.31*** [0.05]	0.32*** [0.04]	0.36*** [0.04]	0.31*** [0.04]	0.29*** [0.04]	0.38*** [0.04]	0.37*** [0.04]	0.40*** [0.03]
$N_{offspring}$ full sample	502	717	885	1064	1178	1216	1189	1194	1308	1550
$N_{offspring}$ balanced panel	218	329	418	534	593	632	661	712	854	996

Notes: First row refers to regression of offspring wealth on parent's wealth (parent's wealth imputed for individuals at peak age (64) and based on education and housing tenure) based on full cross section sample. Second row refers to equivalent statistic based on balanced panel (wave 3). Third row same as second except measured at wave 5. In all specifications both offspring and parent wealth have been log transformed.

Another and perhaps more intuitive way of reading the results in Table 6 is to compare estimates at wave 5 with those at wave 3 for a cohort aged 4 years older, giving estimates at the same age for cohorts born 4 years apart. So, the cohort aged 32 in Wave 3 (2012) was born in 1980 was aged 36 by Wave 5 and has an estimated intergenerational beta of 0.56, for the preceding cohort aged 36 in Wave 3 the beta was just 0.39. This is an extreme example, and the differences are quite noisy, but the general pattern is clear and suggests younger cohorts are exhibiting higher intergenerational correlations that are on average in the region of 0.05 higher over every 4-year period. This reflects both that the younger cohorts are starting with elevated associations (that is higher because of past changes) and then on top of this they are also rising over the 4 years of data observed. Rank-Rank based estimates show similar increases in correlations across cohorts 4 years apart at the same age at younger ages, though this stabilises more at older ages. Future research will explore the role of home ownership, pensions and other financial wealth in driving this result, but the evidence of Figures 3 and 4 suggest both housing and pensions are making contributions.

Table 6 then shows rapid and diverging outcomes in wealth for successively younger cohorts. We can extend this to Round 6 of the data (the terminology of the survey switches from waves to rounds) and formalize this further in a pooled regression approach using the unbalanced panel and is shown in Table 7.

Table 7: Change in intergenerational elasticity between wave 3 and round 6 among individuals 33-64 (continuous age specification).

Covariates	β (σ)
Age	0.147***
	(0.0154)
Age square	-0.00103***
	(0.000139)
Parent's wealth	0.414***
	(0.0233)
Wave 4	-0.286**
	(0.114)
Wave 5	-0.462***
	(0.152)
Round 6	-0.453**
	(0.198)
Parent's wealth*wave 4	0.0192**
	(0.00946)
Parent's wealth*wave 5	0.0399***
	(0.0125)
Parent's wealth*Round 6	0.0378**
	(0.0162)
Age*parent's wealth	-0.00367***
	(0.00115)
Constant	6.416***
	(0.292)
Observations	31,643
R-squared	0.207

Notes: ***, **,* refers to significance at 1%, 5% and 10% level respectively. Robust standard errors reported in parenthesis and clustered at individual level. Regression of offspring wealth on parent's wealth, pooled across all individuals aged 33-64. Age measured in years. Wave enters as a dummy variable. In all specifications both offspring and parent wealth have been log transformed.

It is a regression modelling an individual's wealth holdings assessed based on age, parent's wealth (the IWE) and terms for the observation being from waves/rounds 4-6 and most importantly for parental wealth effects over ages and in subsequent waves. These latter terms are then reflecting whether later observations have divergent associations with parental wealth compared to wave 3 at the same age. Or more simply the extent to which the IWE is changing for cohorts born 2, 4 and 6 years later.

The estimates imply (row 3) the IWE is on average 0.41 for the base age of 31 but is falling by 0.0037 with each year of age above 31 (Row 10). Giving an average IWE of 0.35 over all ages for the year 2012. Over successive waves wealth has fallen by 45 log points but the relationship with parental wealth has rising by 0.038 over this interval or roughly 0.0063 points per year.[9] Evaluated at the mean of parental wealth then says that wealth has not changed much across cohorts at the same age between Wave 3 and Wave (Round) 6. What has changed is the strength of the association between offspring and parental wealth. At 0.038 higher for people at the same age but born 6 years later, this is very large in terms of magnitude (on a base of 0.35). The available data is insufficient to be conclusive on age variation in this rise but it appears broadly age neutral. Thus, the younger cohorts have an IWE rising from around 0.4 to 0.44 between 2012 and 2018. Table 7 also shows that Wave 5 and 6 have changed little, so the process may have stopped. Consistent with our previous findings Table 7 shows the interaction effect of offspring age and parent's wealth is negative, underlining the growing influence parent's wealth has on wealth holdings of successively younger cohorts. Collectively the findings in Tables 6 and 7 have significant implications for our understanding of the rate of change in wealth inequalities in GB: they are changing at a very rapid pace. Policymakers who are serious about improving life chances must recognise parental wealth plays a major role and this role is rapidly increasing in importance for younger cohorts. Put another way, individuals born to wealthier parents accrue more wealth over their life course and the extent of this advantage has moved at pace. Producing a very different picture between those aged in their 30s in 2018 with an IWE of 0.44 and those aged in their 60s in 2012 where it stood at 0.3.

Conclusion

We document the level of intergenerational transmission of wealth in Britain based on representative high quality survey data. After dealing methodological challenges, we conclude that the estimated intergenerational transmission of wealth is 30% of wealth differences in the parent generation passing onto the offspring for peak wealth just prior to retirement (born around 1950) based on both rank ordering and values of wealth holdings. As this wealth funds consumption in retirement, it is at this age that is most suited to assessing life-time wealth accumulation. In current cross-sectional data an average 35% rate of transmission applies to age groups from 32 through to 64, which is surprising as wealth inequalities rise strongly with age. Our estimates are consistent with studies documenting the extent of intergenerational wealth transmission in Scandinavia and the US, placing the UK

[9] We also estimate alternative specifications to detect non-linearities in age however find no evidence to support this (see appendix E).

between them. In addition, our central estimates are not dissimilar to those found for earnings persistence across generations for a cohort born around 1970.

The findings show that younger cohorts born 1968 onwards have higher levels of cross-generational persistence in wealth than those aged in their 60s. This is surprising and the evidence is clear from the balanced panel data, that this persistence rises steadily as people age. The panel data clearly shows that there is far higher wealth persistence than for people who were at the same age just 6 years previously. The speed of change is large - we estimate the rate at which the IWE is rising at 1.26 percentage points every two years. The combination of higher values for younger cohorts in 2012 and rises through to 2018, predict a IWE of 0.44 for those in their 30s in 2018 compared to 0.3 for those in their 60s in 2012. An extremely dramatic shift. The implications for future wealth inequalities are profound and must be addressed. Clearly, understanding the mechanisms driving the changes we observe is of paramount importance to design policies which will successfully slow down the rate at which wealth inequalities are widening. Ongoing research will precisely do this.

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Appendix

A: Definition of derived variables used from Wealth and Assets Survey

Table A1: Definition of derived variables.

Variable	Definition
Total net wealth	Total sum of: Individual net value of all (main and other) property, individual net financial wealth (includes endowment), individual physical wealth (including durable goods) and individual pension wealth.
Pension wealth	Total sum of: occupational Defined Benefit (DB), occupational Defined Contribution, retained rights in DB schemes, retained rights in DC schemes, value of additional voluntary contributions (AVCs), value of personal pensions, value of retained rights in defined benefit pensions, value of retained rights in defined contribution pensions, value of retained rights in drawdown, value of pensions in payment and value of pension from former spouse of partner.
Net property wealth	Individual net value of all (main and other) property
Net financial wealth	Total value of all formal assets (current account, savings, ISAs, national savings product, shares, insurance, bonds, employee shares, unit and investment trusts, overseas

	shares, bonds/gilts (home and abroad), any other investments) PLUS total value of informational assets PLUS child trust funds, other children's assets, endowments. MINUS Total financial liabilities (total credit card balance, total value of store cards, mail order, hire purchase, total amount of all loans, mail order arrears, hire purchase arrears, loan arrears, total bill arrears, current account overdraft, total value of student loans).
Proportion reporting housing wealth	Proportion of individuals in sample who report having a strictly positive amount of net housing wealth.
Proportion with pension wealth	Proportion of individuals in sample who report having a strictly positive amount of pension wealth.
Proportion with financial wealth	Proportion of individuals in sample who report having a strictly positive amount of financial wealth.

Appendix B: Rank stability in income

Table B1: Rank stability in come 2 and 4 year panels.

Age Group at wave 3	Rank-Rank correlation based on actual income using panel (2 years)	Rank-Rank correlation based on actual income using panel (4 years)
25-29	0.62	0.60
30-34	0.75	0.71
35-39	0.78	0.74
40-44	0.79	0.72
45-49	0.79	0.77
50-54	0.79	0.70
55-59	0.73	0.60

Notes: based on waves 3-5 of WAS. 2 (4) year correlation refers to correlation within panel between wave 3 and 4 (5).

Appendix C: Predicted and actual rank correlations (two year panels)

Table C1: Rank correlations (actual and predicted) based on specification which controls for housing and pension wealth.

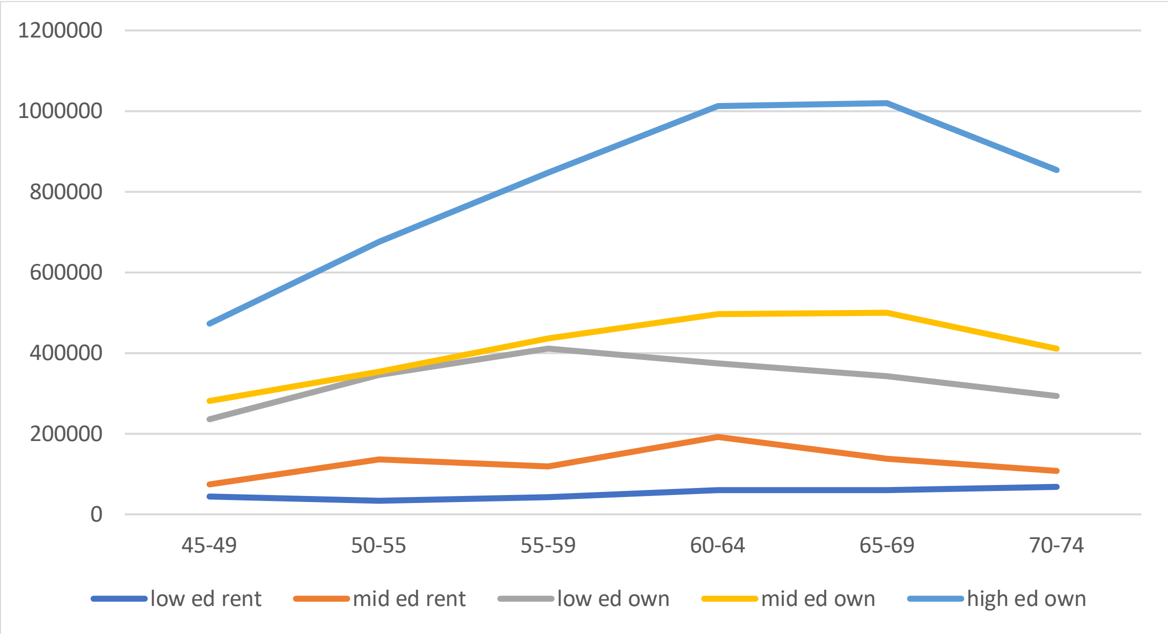
Age Group at wave 3	Rank-Rank correlation based on actual wealth using panel	Rank(predicted, w3)-Rank(predicted, w4) correlation	Rank(predicted, w3)-Rank(actual, w4) correlation	Rank (actual, w3)-Rank (predicted, w4) correlation based on predicted wealth	Correlation of residuals at wave 3 and wave 4
25-29	0.72	0.74	0.42	0.50	0.68
30-34	0.84	0.79	0.69	0.59	0.84
35-39	0.85	0.86	0.64	0.57	0.70
40-44	0.87	0.80	0.60	0.63	0.34
45-49	0.89	0.84	0.65	0.63	0.71
50-54	0.89	0.84	0.65	0.65	0.70
55-59	0.90	0.80	0.66	0.64	0.66

Notes:*** corresponds to 1% significance level. Estimates based on waves 3 and 5 of WAS. Figures quoted in 2015 prices. Specification refers to regression of wealth on education, occupation, rank of income and region plus interaction of education with dummy for housing and pension wealth.

Appendix D: Net wealth by individual's own characteristics.

Figure 5 shows the observed net wealth of age groups according to their own education and housing status, in contrast to Figure 2 which was by their parent's characteristics. Middle and low educated owner occupiers have similar wealth for age groups below 60 but the rank ordering is stable across all age groups. We can use this to create rank position for the parents' generation. Thus, for offspring aged 30-35 their parents age is roughly between 55 and 70, with a focus on 60 to 64 (corresponding to peak wealth). The rank ordering of wealth is constant in these age ranges and so the exact age of parents will not matter here

Figure 5: Net wealth by age and own education and housing tenure



Notes: estimates based on wave of WAS (2010-2012). Legend refers to 5 groupings based on parent characteristics. Figures correspond to 2015 prices.

Rank-rank correlations or regressions require relatively plausible assumptions. We observe the rank wealth position for offspring and have retrospective data on their parents for which we can impute a rank ordering. So, for offspring ages 30-35 we have parent's education and home ownership details when the offspring was aged 14. Thus, when the offspring are answering they are recalling circumstances when the parents were in their 40s and as shown previously the arrival of a major asset (in terms of magnitude) after 40 is rare. Hence both their education and homeownership status are fixed from then on, in most cases. And whilst we do not know actual wealth the rank ordering of the five parent groups based on cross section data is remarkably stable from 45 to 75 as shown in Figure 5.

A direct implication of rank stability holding is that for offspring aged over 45 and parents approximately aged over 75 we assume that this rank ordering across the five groups is stable, even if values and the proportions in each grouping change. Given observed stability in Figure 5 between ages 45 and 75 we argue this is not unreasonable.

A common problem with the analysis of (net) wealth is that wealth measures are often zero and even negative when debt is considered. The measures of wealth contained in WAS are broad and include debt and assets (jewelry, cars, laptops) and is almost never zero (or negative) for adults aged 25+.

Appendix E

Table E1: Change in intergenerational elasticity between wave 3 and round 6 among individuals 33-64 (dummy specification).

Covariates	β (σ)
Age 33	Reference age
Age 34	0.257*** (0.0718)
Age 35	0.268*** (0.0509)
Age 36	0.495*** (0.0691)
Age 37	0.485*** (0.0603)
Age 38	0.591*** (0.0701)
Age 39	0.778*** (0.0647)
Age 40	0.791*** (0.0671)
Age 41	0.866*** (0.0690)
Age 42	0.972*** (0.0655)
Age 43	0.999*** (0.0676)
Age 44	1.036*** (0.0665)
Age 45	1.187*** (0.0671)
Age 46	1.197*** (0.0657)
Age 47	1.324*** (0.0671)
Age 48	1.416*** (0.0651)
Age 49	1.533*** (0.0659)
Age 50	1.526*** (0.0649)
Age 51	1.658*** (0.0645)
Age 52	1.687*** (0.0648)
Age 53	1.710*** (0.0656)
Age 54	1.836*** (0.0656)
Age 55	1.809***

	(0.0670)
Age 56	1.956***
	(0.0648)
Age 57	1.979***
	(0.0654)
Age 58	2.027***
	(0.0651)
Age 59	2.109***
	(0.0656)
Age 60	2.182***
	(0.0638)
Age 61	2.218***
	(0.0636)
Age 62	2.232***
	(0.0627)
Age 63	2.289***
	(0.0617)
Age 64	2.304***
	(0.0613)
Parent's wealth	0.347***
	(0.0107)
Wave 4	-0.268**
	(0.114)
Wave 5	-0.434***
	(0.151)
Round 6	-0.403**
	(0.196)
Parent's wealth*wave 4	0.0177*
	(0.00945)
Parent's wealth*wave 5	0.0375***
	(0.0124)
Parent's wealth*Round 6	0.0335**
	(0.0160)
Constant	7.132***
	(0.141)
Observations	31,643
R-squared	0.207

Notes: ***, **,* refers to significance at 1%, 5% and 10% level respectively. Robust standard errors reported in parenthesis and clustered at individual level. Regression of offspring wealth on parents wealth, pooled across all individuals aged 33-64. Age and wave enter as a dummy variables. In all specifications both offspring and parent wealth have been log transformed.

Table E2: Change in intergenerational elasticity between wave 3 and round 6 among individuals 33-64 (continuous age and age^2 specification).

Covariates	β (σ)
Age	0.100***
	(0.00469)
Age square	-0.000928***
	(0.000138)
Parent's wealth	0.347***
	(0.0107)
Wave 4	-0.268**
	(0.114)
Wave 5	-0.429***
	(0.151)
Round 6	-0.400**
	(0.196)
Parent's wealth*wave 4	0.0177*
	(0.00944)
Parent's wealth*wave 5	0.0370***
	(0.0124)
Parent's wealth*Round 6	0.0331**
	(0.0160)
Constant	7.245***
	(0.137)
Observations	31,643
R-squared	0.206

Notes: ***, **,* refers to significance at 1%, 5% and 10% level respectively. Robust standard errors reported in parenthesis and clustered at individual level. Regression of offspring wealth on parent's wealth, pooled across all individuals aged 33-64. Age measured in years. Wave enters as a dummy variable. In all specifications both offspring and parent wealth have been log transformed.

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